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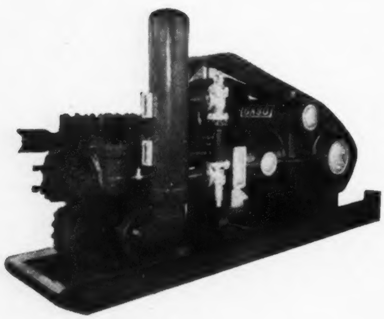

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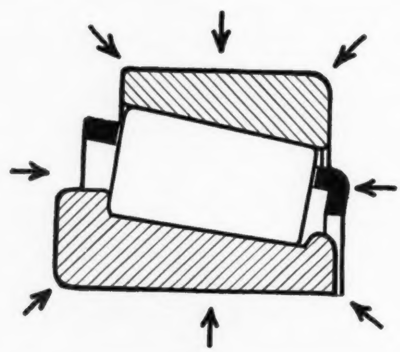

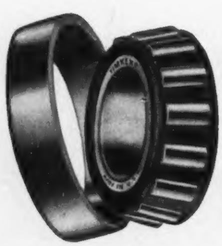

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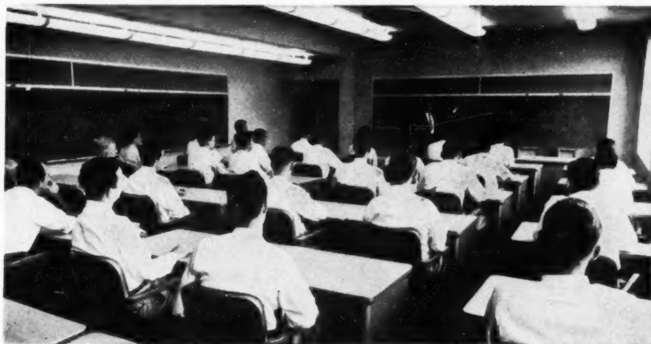

A typical scene in one of the several modern classrooms in the new Educational Center Building.

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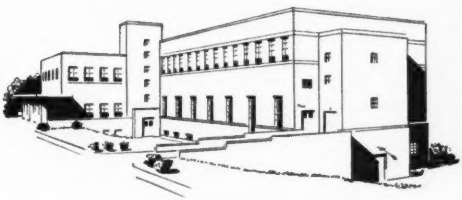

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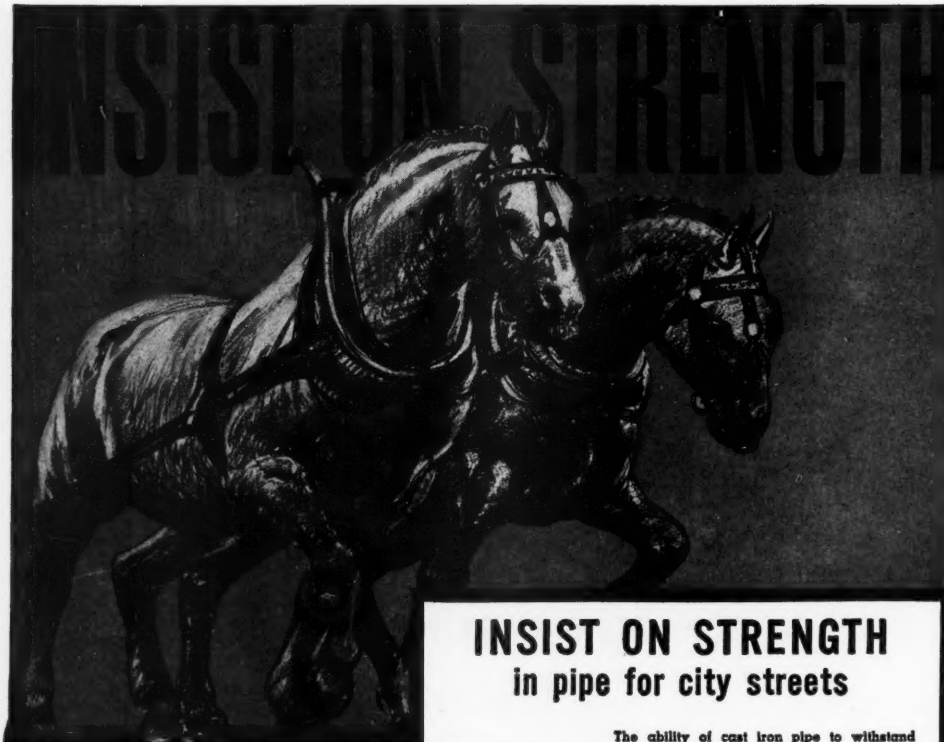

INSIST ON STRENGTH
in pipe for city streets

CRUSHING STRENGTH — The ability of cast iron pipe to withstand external loads imposed by heavy fill and unusual traffic loads is proved by the Ring Compression Test. Standard 6-inch cast iron pipe withstands a crushing weight of more than 14,000 lbs. per foot.

BEAM STRENGTH — When cast iron pipe is subjected to beam stress caused by soil settlement, or disturbance of soil by other utilities, or resting on an obstruction, tests prove that standard 6-inch cast iron pipe in 10-foot span sustains a load of 15,000 lbs.

SHOCK STRENGTH — The toughness of cast iron pipe which enables it to withstand impact and traffic shocks, as well as the hazards in handling, is demonstrated by the Impact Test. While under hydrostatic pressure and the heavy blows from a 50 pound hammer, standard 6-inch cast iron pipe does not crack until the hammer is dropped 6 times on *the same spot* from progressively increased heights of 6 inches.

BURSTING STRENGTH — In full length bursting tests standard 6-inch cast iron pipe withstands more than 2500 lbs. per square inch internal hydrostatic pressure, which proves ample ability to resist water-hammer or unusual working pressures.

Long life and low maintenance cost of mains laid under city streets depend not only on effective resistance to corrosion but on definite strength factors. The four strength factors that pipe must have to withstand beam stress, external loads, traffic shocks and severe working pressures, are listed on the page opposite. No pipe that is deficient in any of these strength factors should ever be laid in paved streets of cities, towns or villages. Cast iron water and gas mains, laid over a century ago, are serving in the streets of more than 30 cities in the United States and Canada. Such service records prove that cast iron pipe not only resists corrosion but combines all the strength factors of long life with ample margins of safety.

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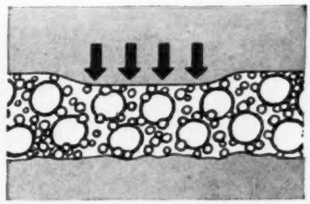


Cross-section *of wax film shows how pressure of foot pushes the hard "Ludox" particles into the wax, causing a snubbing action.*

With silica, water and imagination Du Pont scientists have found

How to Tame Slippery Floors

Teen-agers in high schools used to have great, if hazardous, fun running and sliding on newly waxed corridor floors. Of late many of them haven't been able to do that. For numerous schools, as well as office buildings and institutions, are now using waxes that have been made skid-resistant.

The product that is taming slippery floors is "Ludox" colloidal silica —adapted by Du Pont chemists to floor wax through cooperative research with the wax industry.

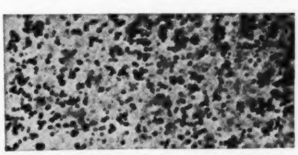
If you mix plain sand with floor wax, you'll have an anti-slip surface, but it would be unsightly and thoroughly impractical. With "Ludox," you are using a water suspension of invisible colloidal silica particles less than a millionth of an inch in diameter.

Du Pont "Ludox" *makes floor waxes harder as well as safer. Other wax qualities—gloss, freeze- and water-resistance, leveling—are unaffected. It is now used by many manufacturers.*

A problem child

"Ludox" was quite a problem child to scientists who developed it. For instance, research men had to know how silica would act in the presence of floor wax. So they turned to the electron microscope and learned that the little silica spheres attach themselves firmly to the surfaces of wax spheres five times their size.

But it was also necessary to find out how "Ludox" affects a waxy film after it is laid down on a floor. While a polished waxed floor looks smooth enough, it is actually a series of hills and valleys and these irregularities have an important bearing on the behavior of a surface.



"Ludox" particles *(dark, in this electron photomicrograph) surround the larger wax particles throughout depth of film.* Magnified 25,000 x.

Working with a waxed surface presented difficulties. The electron microscope functions only if electron beams can pass through the membrane upon which the specimen is placed. And electrons can't "see through" a floor!

Study in duplication

Often, problems like this have been solved by preparing a thin replica or copy of the surface for examination in its stead. However, the conventional method for making a replica—the one frequently used in studying metals—requires solvents. These would dissolve and ruin a wax surface.

So it became necessary for the chemists and electron microscopists to develop an entirely new way to make a replica of a surface. This they did, as part of a research program that lasted several years.

With it some remarkable pictures were made. They showed that many "Ludox" particles stay at the surface of a wax film, even though they are denser than wax. As you walk on a floor, your shoe presses the tiny silica particles down into the wax spheres that make up the film. This sets up a snubbing action which keeps you from slipping.

Much more could be told about Du Pont research on colloidal silica. For example, chemical and mechanical engineers had to develop manufacturing equipment, including a specially designed ion exchange column. Organic and physical chemists used research findings to formulate better waxes, as well as silica-containing adhesives and anti-slip treatments for rayon fabrics. Like practically all Du Pont achievements, "Ludox" is the result of close, continuous teamwork of men and women trained in many fields of science.

DID YOU KNOW . . .

it costs more than $10,000 on the average to provide the tools, machines, factory space and working capital for an American worker. Du Pont's average operating investment per employee is $17,800.

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Cover: Professor Guy Grantham demonstrates the conservation of angular momentum.

—Photo by Robert Stuckelman

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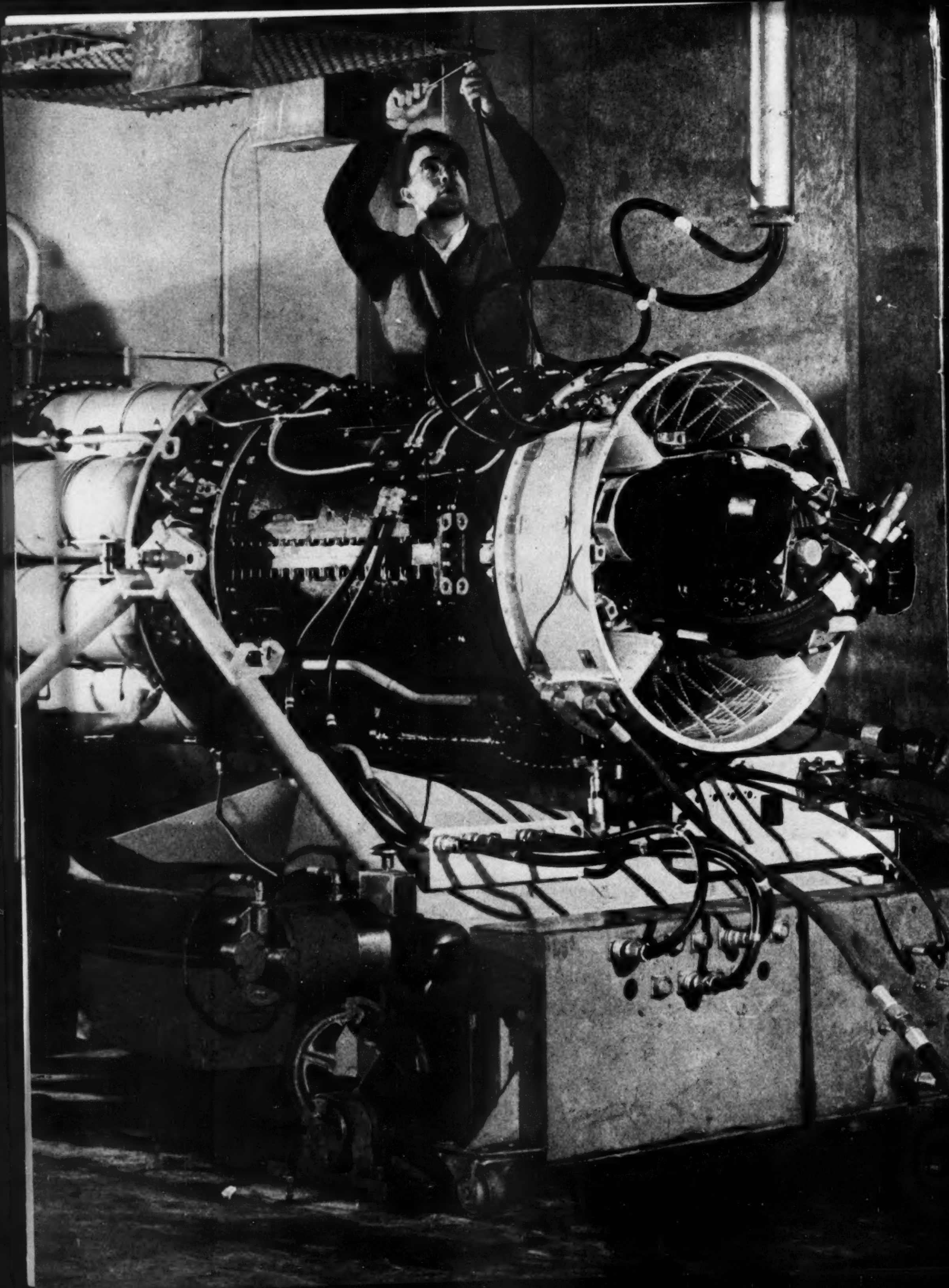


Origin of The Universe

By GEORGE WOLGA, EP '53

The explanation of the nature and functioning of the universe has been perhaps the most basic and elusive problem ever to perplex scientific theorists. From prehistoric time to the present, man has gazed in wonder from his insignificant sphere into that dark and endless space which is the universe, and speculated why and how things are.

Two questions have been prominent in his thoughts: How, and in what form, does the universe function? How and when did the solar system appear? Although *the* answer cannot be assuredly stated, scientific developments enable us to make better guesses today than ever before.

Man's early notion that the earth was the center of our planetary system, and this system the center of the universe, was dismissed with the work of Copernicus and Kepler, who saw the planets as revolving about the sun. Subsequent work was limited to a consideraton of only the planets and their orbits, however, as Newton's laws, the only tools of the cosmogonists, were insufficient to deal with the whole universe.

Mathematical Model

It was not until the development of the Quantum Theory and Einstein's statement of his basic equations that the universe could be approached with mathematical equations. At this time, the first modern models of the universe were made. Einstein's own first model was a static and finite universe of uniform matter without motion. To calculate the size of the universe the cosmogonist needs to know the total mass contained within it. Einstein lacked this figure and so used a minimum value of the average density of matter with which he calculated a universe of radius equal to 35,000 million light years. This obviously did not describe the actual universe which incorporates motion, to illustrate a striking ommission from the model. What it did do, though, was indicate some general aspects, such as a homogenous distribution of matter in space and a reasonable estimate of size.

Readying the powerful J-47 aircraft jet engine for its initial test. Rated at more than 5000 pounds thrust or driving force, this jet is the powerplant of tthe speed record holder, the North American F-86 fighter.
—*Courtesy General Electric*

Exploding Universe

With the design and use of large mirror telescopes, an interesting and very revealing fact was noticed. Spectrograms of light from distant galaxies show a dominant shift to the red end of the spectrum. This "red shift" was interpreted with the aid of the wavelike property of light, whose frequency increases as the source approaches the observer and decreases as the source recedes. The "red shift" indicated that the distant galaxies were moving away from us at tremendous speeds. In the late 1920's, Edward Hubble showed that this motion of the distant galaxies away from the earth was directly proportional to their distances. The proportionality factor adopted gave galaxies 2 billion light years away the velocity of the speed of light! This isn't real motion in an ordinary sense, but rather, the rate at which space is expanding. Thus, the notion of an expanding universe was adopted and incorporated into the non-static models of the universe.

There are, in general, three such non-static models under discussion in scientific circles today. The first, or Monatonic models, expand steadily from singular states in the past to infinity in the future. Under this set-up, the density of the universe is decreasing in direct proportion to this rate of expansion. The second, or Asymptotic models, approach a fixed final state—one type expanding *towards* Einstein's original static universe, the other expanding *from* the static Einstein model to an empty universe of zero density. Finally, the Oscillating models alternately expand and contract with no finite beginning in the past nor forseeable end in the future.

Philosophical Argument

An interesting philosophical argument arises among proponents of the three models. Some cosmogonists hold that there should be no preferred time to observe the universe as the first two models imply. These would have us existing in a special time with respect to the expansion and spending an infinitely long period in other time (from now to infinity on the time scale). On the other hand, the oscillating models give the universe an infinitely old existence.

The universe is today visualized as mostly space filled with interstellar dust composed of particles of matter. Galaxies are now be-

(*Continued on page 24*)

Supersonic Stovepipes

By THOMAS J. KELLY, ME '51

One of the many incidents in the cold war in Europe between the Western and the Soviet blocs was the loss of an American military airplane over the Baltic Sea on April 8, 1950. The plane was reported by Navy authorities to have been a Privateer, an unarmed reconnaissance version of the B-24 bomber, which had strayed off its course on a routine training flight, and upon appearing over Soviet territory was evidently shot down by Russian fighter planes. The Soviets reported that an American B-29 bomber had appeared over the Latvian coast, and had fired upon a Russian fighter which went up to investigate. Simultaneously in Moscow four Red Air Force pilots from the Baltic area were decorated for the "excellent fulfillment of duty," the nature of which was not disclosed.

Eleven days after the plane disappeared, the Swedish trawler Nordgren fished a bullet-riddled life raft out of the Baltic. When the raft was positively identified as having belonged to the missing aircraft, the State Department sent an official note of protest to Moscow, and the Senate unanimously voted a posthumous decoration for the four officers and six enlisted men of the ill-fated ship.

The newspapers dropped the matter there. Many other cold war incidents throughout the world that were just as vicious as the Baltic Sea episode were claiming the public's attention. But an interesting comment did appear in the New York Times shortly after the affair had slipped from the headlines.

In the Times article a German scientist who did much work on the notorious V-1 and V-2 flying bombs, and who is now working on missile and rocket research for this country, ventured to say that the reason the Soviets had been so quick to dispose of the errant American airplane was because it had strayed too close to the great German guided missile development center of Peenemunde, which is now, of course, working for Soviet Russia.

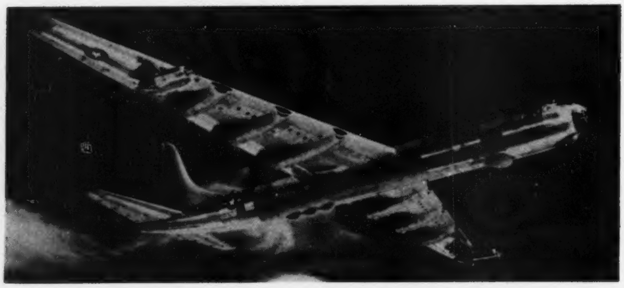
Peenemunde, located on the Baltic Sea in what was formerly East Prussia, was to Hitler's Germany what White Sands, New Mexico, is to the United States. The sprawling development and testing area, with complete facilities for the design, manufacture, and firing of the most complex types of jet-propelled and rocket missiles, was planned and constructed even before World War II began, as part of the Hitlerian rise to power. Here the fearsome V-1 and V-2 weapons were conceived, tested and perfected. The men of Peenemunde were consistently ahead of the men of White Sands during World War II; much of their work stands today as the best reference available on certain phases of guided missile work. And now the entire facilities of Peenemunde, which were captured intact, and most of the original staff, are working for the Soviet Union.

From this information any number of ominous conclusions can be drawn, and the most ominous is probably most nearly true. From the record of Peenemunde it is likely that they must now be making good progress in guided missile design, the ultimate goal of which would be a missile capable of carrying an atomic warhead at supersonic speeds to any point on the earth. In the face of such a shuddering possibility, it is prudent to learn something about the problems and properties of guided missiles, with the idea of gaining some insight as to how far away from practicality this weapon may be.

Guided missiles will always be expensive, and from a cost viewpoint alone it is essential that none be lost by enemy counter-meas-

Turbojet engines, like the cutaway J-47 (below) are currently being adapted for use in supersonic missiles. The expensive, complex construction of the turbojet as compared with the ramjet is a deterrent to turbojet use in non-returnable projectiles, but the better performance under off-design conditions still makes them attractive for missile use.

—Courtesy General Electric



ures. With this in mind, the first requirement for such a missile is that it travel at velocities greater than the speed of sound, or else modern radar-controlled antiaircraft defenses and jet-propelled interceptor planes would destroy most of the missiles in the air, leaving the nation which fired them financially weakened but no better off militarily. Probably the most familiar example of a supersonic missile is a bullet from a high-powered rifle, which always strikes its target before the sound of its own approach arrives. A supersonic missile, arriving over its unsuspecting target with no tell-tale sound, would be a terrifying weapon indeed.

Supersonic missiles of any appreciable operating range require a tremendous power supply to keep them going. For extremely high power outputs combined with low weight, ramjet and rocket propulsion systems have been found most suitable, although considerable work is being done on adapting standard aircraft turbo-jet engines to supersonic uses. Rocket power is extensively used at present in the bazooka gun, airborne armor-piercing rockets, and take-off assist units, as well as in high-altitude research missiles like the Wac Corporal, whose immediate predecessor was the V-2. Except for guided missile applications, ramjet power is not presently used.

So the missile will be supersonic and either rocket or ramjet powered. But it must be a guided missile, which means it must be subject to control of its direction and altitude at any time during its flight. The problems of missile guidance are much too complex to discuss here; however with the aid of modern electronics and servomechanisms, several missile-guidance schemes have been developed which show considerable promise so far. In general, the guidance systems operate on the principle of riding a high-frequency beam to a point somewhere near the target, at which time control passes to a homing device in the missile itself which directs the missile unerringly to the target. The guidance beam is maintained by transmitters at the launching site and possibly at points along the flight path, and may be adjusted during the flight to compensate for any errors in the missile's progress. Homing may be accomplished by several methods: radar scanners, which home on the largest object in sight, are useful against ships; heat-seekers, sensitive to warm objects, could be used against blast furnaces and similar industrial targets; radio-controlled units will home on small transmitters previously dropped by parachute on the target. It seems likely that entirely workable missile-guidance units will be perfected in the near future.

Seemingly less complicated, though actually more basically difficult than the problem of guidance is that of propulsion. To propel a missile carrying less explosive than a 1000-pound bomb at a speed of Mach 2.0 (twice sonic velocity) would require upwards of 10,000 horsepower! Rocket power can produce phenomenal power outputs for a short period of time, and is commonly thought of for use on long-range missiles in which the rocket boosts the missile up out of the earth's atmosphere, and coasts the rest of the way through the rarified upper air. Ramjets differ from rockets mainly in that they obtain oxygen from the air to support combustion, instead of carrying their own. They are smaller than rocket units, but are limited to lower altitudes where atmospheric oxygen is available. Since the problems of rockets and ramjets are similar in many respects, we shall say no more about rockets, but will confine our attention to a discussion of supersonic ramjets.

A ramjet motor is simply a tube or duct in which air is compressed by high-velocity ramming, mixed with fuel, and accelerated by the rapid increase in its specific volume (volume per unit weight) accompanying the combustion process. It has been occasionally referred to as a "flaming stovepipe." Figure 1 shows a typical ramjet motor. Sections 1 and 2 constitute the diffuser, where the high-velocity intake air is slowed down by the increase in cross-sectional area of the tube, and the velocity energy possessed by the air is converted to pressure energy. Sections 2 and 3 contain the fuel injection nozzles and the flame-holder, and sections 3 and 4 include the combustion chamber, where the mass of air passing through the tube is accelerated. There may be an exit nozzle following the combustion chamber, especially where maximum range is desired, but a nozzle is not essential for the operation of the ramjet.

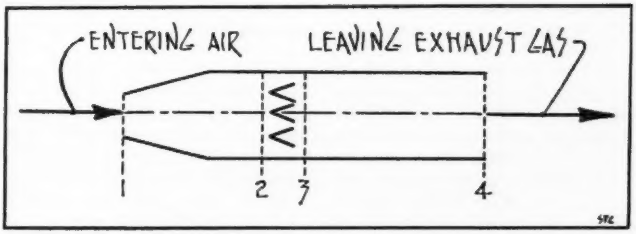


Figure 1. General open-nosed ramjet configuration.

Principle of the Ramjet

Now to determine how a net forward force (thrust) is produced on a ramjet motor: Briefly, and by no means completely, the idea is this: Referring to figure 2, consider the ramjet to be stationary, and high-velocity air to be entering it at station 1. In the diffuser the ramming effect of the air is capable of raising its pressure as the velocity of the air decreases because it is passing into a region of larger cross-sectional area. However, this high pressure could not possibly be maintained in the diffuser unless something acts to effectively close off the exit end of the tube, for it would be like trying to pump up a punctured tire. By adding heat to the air and raising its temperature, the volume of the air is greatly increased, by so much that the exit area at section 4 is not large enough to accommodate all the air which

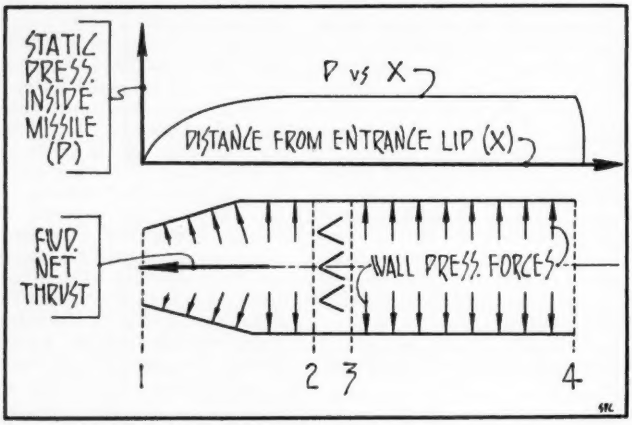


Figure 2. Static pressure distribution inside ramjet.

wants to leave. The tail-pipe therefore acts as a restriction which enables the ram air compression effect to maintain a high diffuser pressure. It is this high diffuser pressure, acting on the change in area from section 1 to section 2, which produces the net forward thrust.

Design Limitations

Limitation to design conditions is one serious drawback to ramjets. Their operation depends largely upon the speed at which they travel, and the properties of the air through which they pass. The motor must be designed for specific values of these variables, and any deviation from the design values will seriously hamper performance, and perhaps render them inoperative. The best remedy for this condition would be a ramjet having variable and controllable intake and exit dimensions, but this is a difficult feat to accomplish mechanically, and so far has not been carried out.

The high-temperature properties available in materials for ramjet construction also limit the performance of the unit. Weight must be kept to a minimum; therefore, the combustion chamber must be constructed of thin sheet material. Even high-alloy steel sheet will not retain much strength at temperatures over 1800°F.; at maximum power output of the ramjet, however, flame temperatures above 3000°F. are not uncommon. At present this means that the ramjet can be operated at maximum power for only a short time, while the combustion chamber wall is heating up to 1800°F. Then the fuel-air ratio must be throttled back, producing less power output and lower speed, but also a lower flame temperature. Metallurgical investigations continue the search for materials having greater strength at higher temperatures. Should new metallurgical developments appear, the power and speed of practical ramjets could be immediately increased.

No less a problem is that of constructing mechanisms which will provide reliable, predetermined control over the fuel-air mixture in the combustion chamber, in order that combustion may be completely and efficiently performed. The mixture-regulating mechanism must provide a constant weight ratio of fuel to air despite varying atmospheric pressure and temperature conditions. It must also be able to throttle back on the fuel at the completion of the accelerating or the climbing phases of the flight. The mechanism is subjected to unusually severe accelerations and vibrations, and therefore must be ruggedly constructed. As yet no fuel control mechanism for ramjets has proven entirely satisfactory.

As might be expected of an engine in which raw fuel is continuously dumped into a high-mass-flow airstream, ramjet motors are not economical of fuel. Increasing motor efficiency to decrease fuel consumption and provide longer range with greater payloads is always the designers' goal. Much is now being done in this area for ramjets. Supersonic ramjet combustion efficiencies until recently were between 68 and 80%, but, by further study of the nature of combustion in a flowing stream and and the redesign of flameholders and fuel injectors, combustion efficiencies ranging from 85 to 95% have been attained. Increased combustion efficiency results directly in increased missile range, bringing inland strategic targets into the area subject to missile attack. Combustion research is now working toward that end.

Other ramjet problems may be summarized briefly:

The need for rocket-propelled boosters to push the ramjet from the launcher to supersonic speed, where the ramjet motor can then take over. Booster design opens a whole new area of rocket-propulsion problems.

The difficulty of ground-testing ramjet engines, because of the prodigious amount of power required to obtain even small airflows at supersonic speeds. Only small (up to 7½ inch diameter) models are generally tested, which introduces uncertainty of results because of the possible size effect.

The lack of a compilation of basic data necessary for solving ramjet problems in a complete, industry-wide form. This hindrance has now been almost overcome.

Solution Difficult

Such are the principal problems of supersonic ramjet propulsion. They will not be easily solved, because they are based upon the rather complex behavior of an actual gas (air), the imperfectly-understood process of combustion, and the difficulties of high-speed, high-temperature aircraft construction. But compromise solutions are possible and practical, and should produce effective ramjet missiles within the next one to three years. Short-range missiles (under 100 miles), for use primarily against ships, troop concentrations, and other tactical targets, will be the

(*Continued on page* 36)

Cartography

By PROFESSOR HERBERT T. JENKINS

Cartography has been defined as the art and science of preparing all types of maps and charts for graphically expressing our conception of what is known about the physical features of the earth's surface. As a corollary to this definition, a cartographer must be both an artist and a scientist. He should have a highly professional background in at least one of the specialized phases of cartography, such as surveying or photogrammetry, as well as a sound basic experience in organizational and administrative activities. He must also be able to present his information in a clear, colorful and pleasing manner.

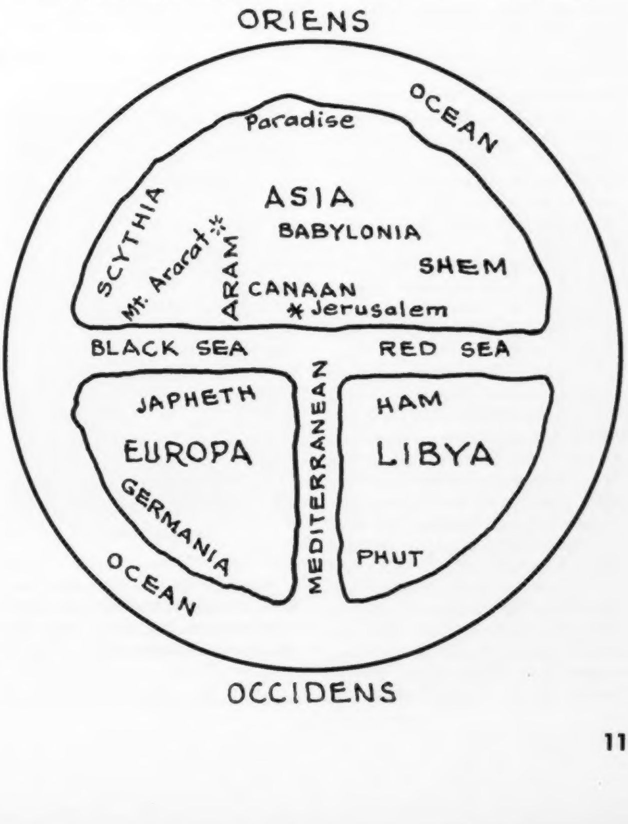
A map, properly lettered, is the usual result of the cartographer's efforts, but other forms of representing the earth's surface are globes, relief models, and cartographs. In each case, of course, the scale of the reproduction is reduced, sometimes as much as five million times. This is, of course, necessary in order to permit us to comprehend the larger earth surface pattern in a single view.

Map making and map reading are subjects which are of great general interest. This universal interest probably stems from our forebears who first traced hunting directions in the dust or snow, since the ability to draw simple maps of nearby regions as they appear from above seems to be inherent in all primitive peoples.

The first portable maps were probably scratched on thin stones or molded in pats of damp clay. The oldest existing map now known is such a clay tablet made about 2500 B.C., showing the confines of one Babylonian land-owner's property. Other early charts were made of palm twigs and shells by Pacific Islanders, or were drawn on seal skins by the Eskimos.

Old maps reflect the advances made in mathematics, astronomy, and philosophy through the ages. For instance, the geographers of 600-500 B.C. visualized the earth as a flat disc completely surrounded by water. About 400 B.C., the conception of a spherical earth developed, and then measurements and records of latitudes, longitudes, and distances were made. Circa 150 A.D., Ptolemy, one of the greatest of the old cartographers and geographers, recorded most of the contemporary knowledge of the world

This medieval map is distorted to show Jerusalem as the center of the world.



in a huge atlas of eight volumes. His dissertations on the fundamental principles of projections, globes, and methods of making maps were of great significance, but much of this information was temporarily lost or ignored during the Middle Ages in Europe. The disc map representing the earth as a flat surface completely surrounded by water once more became prominent as the famous "T in O" map, even though the early idea of the earth as a sphere was not entirely lost. This medieval map was distorted to conform to the teachings of the early church, with Jerusalem as the hub of the circle.

After 1200 A.D., a new series of charts developed as a result of extensive naval trade around the shores of the Mediterranean. These "portolan charts" were published in a portolano—a book for navigation—containing descriptions of ports and sailing directions. They were practical and accurate, and were closely guarded by their owners as trade secrets. These maps were undoubtedly perfected because of the extensive use of the magnetic compass and early astronomical devices. Certainly Marco Polo's world travels and the expeditions of the Portuguese mariners spurred the efforts of the early cartographers.

About 1500 a number of events combined to activate further the science of cartography. Probably the invention of printing and engraving was the greatest single development affecting this renaissance, but the travels and discoveries of Columbus, Magellan, and Drake, and the scientific accomplishments of Frisius, Copernicus, and Mercator contributed in a large degree.

From the 1700's to the present century, maps and charts continued to proceed toward a more dependable and artistic product, although many blank spaces on the sheets or globes were filled with artistic and legendary information which was totally useless. The need for accurate and complete military maps of Europe and Asia was acute in view of the numerous military expeditions and defenses occurring throughout this period, but the overall scope of each project was of such a size as to exclude all private enterprise. National surveys in France, England, and other countries were financed by the governments for political reasons as well as for war, and surveying and mapping became highly productive phases of governmental activity. Improvements in lithography and engraving procedures were also developed for mapping, and photography was advanced to an excellent and dependable level. Mapmakers and publishers throughout the world were producing high grade colorful sheets well within the reach of the general public.

Airplane Used

At the turn of the 20th century, the automotive industry overcame transportation difficulties with such speed that the need for good maps of every accessible area became very severe. Fortunately, however, this same industry produced, in the airplane, a tool for obtaining highly detailed photographic information which can be accurately analyzed and reproduced as a series of maps. These recent developments in the wide field of cartography are the items to be considered in the remainder of this paper.

Aerial photography is a particularly effective tool in making large scale topographic maps, but cannot at this time be considered effective in making world or continental maps. Geodetic surveys are still very important for developing a triangulation network over the geographical surface of our world, a network upon which we can lace the smaller portions of our photogrammatric efforts. But a controlled series of photographs can be obtained from the air in a few hours; they can be analyzed and interpreted in a few weeks, and can thus replace the tedious labours of a field party for months or even years. This does not mean, however, that field surveying will be unnecessary. Control surveys are still needed, and field completion parties must still interpret the pictures and clarify obscure data. In order to simplify this chore in the United States, photographs are usually taken in the spring, when the leaves on the trees are very small and snow does not blanket the physical contours of the ground. Heavy foliage in wooded areas makes it diffi-

(Continued on page 30)

THE AUTHOR

Professor Jenkins

Professor Herbert T. Jenkins was born in Detroit, Michigan, in 1902, and received his M.S.E. from the University of Michigan in 1930. At that time he was engaged in Soil Mechanics Research for the Wayne County Road Commission, with special emphasis on the bearing capacity of soils.

In 1935 he was appointed to the Cornell Civil Engineering Faculty to work under Professor "Johnny" Parson. Since 1937 he has been Head of the Civil Engineering Drawing Department. His newest interest is in the field of cartography, stimulated by the fact that he spent his Sabbatic leave last year as a Cartographer with the U.S. Geological Survey.

Professor Jenkins has been engaged in consulting work as a Registered Professional Engineer, and is a member of ASCE, ASEE, AAUP, Chi Epsilon and Pyramid. He is engaged at present in developing his courses in Cartography for the "Cornell Center of Integrated Aerial Photographic Studies."

News of the College

Professor Schauss Dies

Stanley L. Schauss, '42, Associate Professor of Electrical Engineering died unexpectedly on January 24 in Newark, N. J.

He had been on sabbatic leave during the recent term, and was working with the Public Service Electric and Gas Company in Newark when stricken. The previous day he had attended the winter general meeting of the American Institute of Electrical Engineers in New York.

Professor Schauss joined the School of Electrical Engineering at Cornell as an instructor in 1942. He became an assistant professor in 1944 and was advanced to associate professor's rank in 1949. His teaching was primarily in the fields of machinery, measurements, and power.

A native of Brooklyn, he graduated as an electrical engineer from Cornell in 1929 and received his master's degree from New York University in 1938. From 1929 to 1934 he served with the sales office of the Westinghouse Electric and Manufacturing Company and was an instructor in physics at Cooper Union in New York preceding his appointment to the faculty here.

Professor Schauss also took an active part in the affairs of the electrical engineering school. He was secretary of the electrical engineering faculty as well as a member of several standing committees. In addition, he belonged to the American Institute of Electrical Engineers, Eta Kappa Nu and Phi Kappa Phi honorary societies.

Summer Courses

The College of Engineering will offer a unique program for engineering teachers and graduate students in the 1951 Summer Session. The courses, especially designed for engineering teachers in mechanics, structures and related fields, are intended to provide an opportunity both for the strengthening of basic backgrounds and the expansion of specific studies in areas of primary importance to engineering instructors.

The program will include six courses: Elementary Mechanics of Materials from an Advanced Standpoint by Professor H. D. Conway, Applied Elasticity also by Professor Conway, Theory of Elastic Stability by Professor G. Winter, Plasticity in Engineering by Professor P. P. Bijlaard, Advanced Structural Analysis by Professor G. P. Fisher, and Aircraft Structures by Professor C. Riparbelli.

Each course carries three semster hours credit; any two may be taken during the summer session of six weeks (July 2-August 11, 1951). The courses will be administered such that the special requirements of the teacher will be considered in the presentation of the program.

Research Projects

Two of the many research projects being carried on in the Chem E school concern liquid-liquid extraction towers and continuous crystallizers.

An extraction tower usually is packed with ceramic objects which serve to increase the area of contact between the liquid containing the desired compound and the liquid which is to extract it. The separations to be obtained from a tower of this sort are not as good as they could ideally be. To increase the time of contact of the liquids, yet not increase the surface area of the packing, (which would be expensive), a piston pump is installed at the base of the column of circulating liquids. The pump applies a continual up-and-down movement to the motion of the liquids, and thus increases the length of time of contact of the liquids, and the column is more efficient as a separator. Power requirements for raising a large amount of liquid, lowering it, and then raising it again, are high, and will tend to prevent the use of this type of column for general industrial purposes. Its main use will probably be in those industries where a minimum contact time is desired between the product and the solution from which it has been made. This would be, for instance, in the anti-biotic industry, where the broths for fermenting cause the breakdown of the anti-biotic. In such cases, this "pulse column" will be helpful.

Another project is the investigation of the factors governing the operation of a continuous crystallizer. In essence, it suspends the growing crystals in an upward-moving stream of the mother-liquor until they are heavy enough to settle out. By nice adjustment, the crystals grown may be of remarkably uniform size. Relations between the rates of flow and size of crystals are being studied, as well as mathematical relations between the other factors, such as temperature and pressure in the other parts of the apparatus.

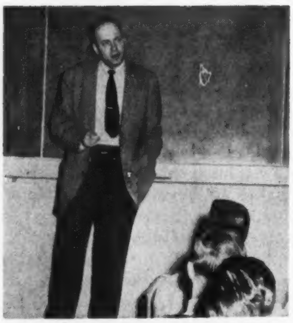
Paper Contest

The student branches of the AIEE and the IRE will hold a technical paper competition for their members on March 9, 1951. The purpose of the competition is to promote interest and ability in the preparation and presentation of technical papers with which all engineers should be familiar.

The competition will be divided into two categories, undergraduate and graduate with cash awards of $25, $10, and $5 being given in the undergraduate division and $20 and $5 in the graduate division. Winners of the first two prizes in the undergraduate competition will be the representatives of the Cornell student branch of the AIEE in the paper competition to be held in conjunction with the Convention of Student Branches at Syracuse on May 4, 1951.

LECTURE DEMONSTRATION

Photographs by Robert M. Stuckleman, EE '54



The lecture demonstration is perhaps one of the most effective methods of instruction known to modern education.

The popularity of this device with both professors and students no doubt lies in the fact that it not only aids in comprehension of subject material, but also lends interest and color to a lecture. If good enough it may even serve to keep the students awake. This is usually accomplished in the more explosive type of demonstration such as one would likely encounter in a freshman chemistry or physics course. We can all recall very well the atomic bomb-like mushroom which filled the lecture hall as Professor Van Artsdalen mixed together hydrogen iodide and sulphurous acid, or the small fireworks display which took place in his demonstration of the thermite process.

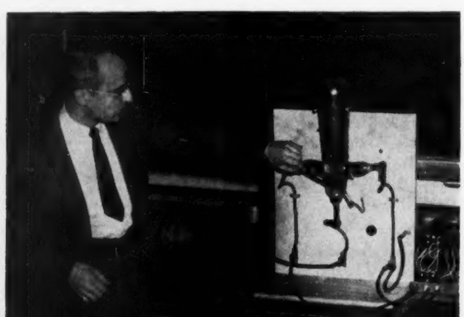
Just as vivid in our memories are the ingenious experiments performed by Professor Grantham as he brought to life such subjects as heat, light, sound, and mechanics. It will be hard to forget the pressure needed to liquefy gases after seeing it at work in the liquid air cannon, or the principle of conservation of energy excitingly demonstrated with the aid of a pendulum. In this experiment Professor Grant-

Upper left. Professor Everett M. Strong demonstrates some of the fundamental laws of electromagnetic induction.

Middle left. Professor Andv Schultz never fails to inspire a class when lecturing.

Lower left. The inner workings of the shaded pole motor are demonstrated by Professor W. E. Meserve.

Lower right. Professor N. Bryant adjusts a mercury arc rectifier.



Flaming Thermite

And Swinging Weights

Help the Student Engineer

To Visualize Theory

ham allows a ten-pound brass ball to swing away from him and then slowly come back perilously close to his face. According to the underlying principle the ball will not hit him if it is allowed to oscillate without having been given an initial push and, of course, provided his head doesn't move. Could any demonstration be more forceful, especially when one false move might prove disastrous to the lecturer?

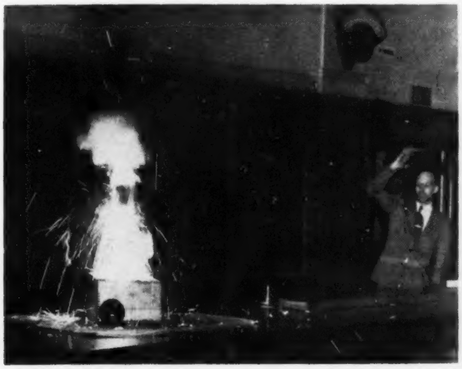
Of course, such spectacular exhibitions are more the exception than the rule. Most of the lecture demonstrations presented here at Cornell are comparatively tame by nature to those already mentioned. In fact, the majority of courses, especially the more advanced ones, will not readily lend themselves to this device. Some professors, therefore, resort to "demonstrations" which do not require any apparatus. A fine example would be Professor Schultz, who is well known for his antics and tart comments in class. These never fail to keep his students amused and interested in the early morning lectures which many engineers would ordinarily utilize to catch up on their sack-time. Many other professors employ the same tactics just to relieve the engineer from some of the drudgery that is ever present in his life.

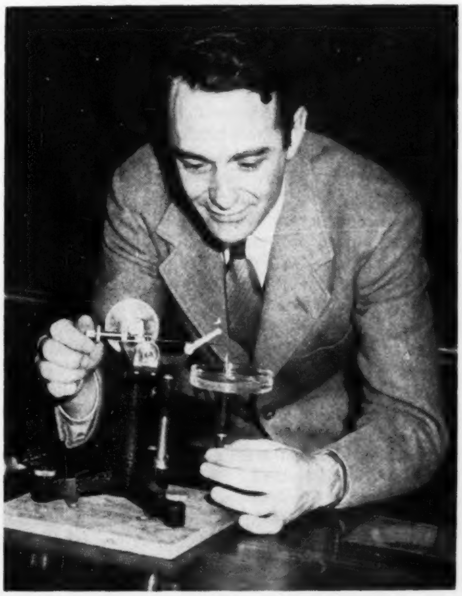
Upper right. Professor Grantham places his nose in the hands of the Law of Conservation of Energy.

Middle right. Professor Newhall gets a large charge out of the Van de Graff generator.

Lower right. The du Noye balance for measuring surface tension is given final adjustment by Dr. Muschlitz.

Lower left. Molten iron burns through the bottom of an iron pot, with Professor Van Artsdalen standing by.





PROMINENT

Paul

Paul Jones, ME

It is amazing what one person can do. Take Paul Jones, for instance. He has worked "part-time" for over 25 hours a week most of the time he has been at Cornell, maintained one of the top averages in the ME school, and been chairman of that amateur organization that does a professional job, YASNY. Paul shrugs it off, saying, "It's just a matter of getting used to it."

The McMullen Regional Scholarship Committee went out to Salt Lake City, Utah, to find Paul, the son of a mechanical engineer. Since coming to Cornell, he has done just about every kind of part-time work —dished out hash in a cafeteria, taken care of a rooming house, doled out reserve books at the Library, and graded papers in the ME school. For the forementioned work, he was remunerated, but in addition he has worked on every Barton Hall dance as a member of that quaintly named group, YASNY. For the past year and a half, he has been chairman, which meant supervising about 50 people and "taking the blame for everything that went wrong." Those who have tripped the light fantastic at the Barton Hall dances will appreciate the tremendous amount of time, troubles, and toil involved in creating that terpsichorean fairyland. Paul reports that the hundred odd hours put in on each dance has been rewarding in the experience gained in supervising people and negotiating with outside parties.

In the ME school, Paul has been an active member of ASME, serving as Vice-chairman one term, a member of Tau Beta Pi, Pi Tau Sigma, Kappa Tau Chi, and recently was elected into the select graduate honorary, Phi Kappa Phi. He has also worked on the Willard Straight Music and Social committees. Last Engineers' Day, Paul was in charge of all the Administrative Engineering exhibits, and one of them won the prize for the best exhibit.

As a member of the first five-year ME class, Paul has been working on an individual project analyzing the sales organization of the Elliott Company. Paul worked with the company—manufacturers of power plant equipment—three summers and has taken their training course for college graduates. Eventually, he hopes to work in the sales department of the company, but in the meantime there is a little matter of a contract with the Naval ROTC.

Joseph Calby, ChE

Wrestling with ChemE reports as well as flesh-and-blood opponents is accomplished with equal facility by Joe Calby. For aside from maintaining a highly respectable academic average (four terms on Dean's List), Joe starred on the wrestling team for three years and last year culminated his mat career by being elected to the captaincy. His skill in the fine art of grunt-and-groan was nicely demonstrated when he placed third in the Eastern Intercollegiates.

A native of Philadelphia, Joe wanted a good chemical engineering education when he graduated from Mercersburg Academy, so, abetted by a McMullen Regional Scholarship, he boarded the Lehigh Valley for Ithaca. He hasn't regretted it since—coming to Cornell, that is. For his first two years, he stuck with the Zzilch (sic) independents, but he was finally induced to become a Sigma Pi in his third year.

Service to this grand institution took many forms for Joe—Chairman of the Student Council Publicity Committee during those hectic election days, Frosh Camp Counsellor, and president of the ChemE elite, Pros-ops. These multifarious activities were recognized by the honoraries of honoraries, Red Key and Quill and Dagger, which elected Joe to membership in his junior and senior year respectively. Proving his versatility in sports, Joe won a varsity letter for 150-lb. football last year.

For two summers, Joe bell-hopped in a hotel, spending a pleasant vacation and earning an ample sum of money. But last summer, he worked as a junior engineer for the Sun Oil Company and found out what a ChemE really does in industry. Joe also discovered that his aptitudes did not lie along the research line, but rather in production or sales promotion work. There is only one hitch in his future plans. Because of circumstances beyond his control, he may have to serve in the armed forces.

Joe

ENGINEERS

Bill

Marjorie Leigh, ChE

Marge Leigh is really a remarkable young lady. What other term could be applied to a girl who combines avid interests in such divergent fields as music, horses, carpentry, human relations and chemical engineering, going about each, and especially the latter in recent months, with a boundless enthusiasm which would tend to revive the long-dead belief in the possibility of perpetual motion.

Marge says her interest in engineering was first aroused in the eighth grade. So, with an eye toward an engineering college education, she worked hard and even took extra math courses while she was at Kent Place School, a private girls' prep school, where she was president of her senior class. The choice of a good chemical engineering school was not difficult, and Marge set her sights on Cornell. However, by some devious machination of the admissions department, she somehow spent a term in the College of Arts and Sciences before arriving at Olin Hall to stay.

Marge

The new arrival lost no time in becoming extra-curricularly inclined. As well as serving as president of her pledge class at Alpha Phi sorority, Marge also diverted her energies into other channels: the Frosh House Committee of the Straight, the Sage Chapel Choir, and the Octagon Club. She was also Class Song Leader, with consequent duties with the Class Council. Later years brought increased participation and responsibility in the affairs of the campus, as Chorus Director of the Octagon Club, Business Manager of the Frosh Camp, Director of the camp the next year, President of her sorority, and Judiciary Committee member of the Womens' Self Government Association. Around Olin, when not busying herself with the task of becoming a competent chemical engineer, Marge acted as Secretary-Treasurer of Pros-Ops, the activities honorary of the Chem.E. School.

Now, as a fifth-year student, she has been living off campus; and is concentrating on her professional interests, sometimes working well into the wee, small hours of the morning on her project. She enjoys her work a great deal, and has very definite plans for applying her hard-earned knowledge after graduation. Potential fields of professional interest to her include technical journalism, marketing, and development. But she definitely wants to keep the human element in any proposed line of employment.

William Jennings, ME

Standing high in his class and well-liked, Wild Bill typifies the Cornell engineer.

Bill came to Cornell because he was impressed by the fine climate. His first visit to the Hill from Evanston, Illinois, was blessed throughout by beautiful weather. Cornell's high rating in engineering circles, and a Pepsi-Cola scholarship helped him to achieve his wish to come here, but he has never felt the same about the weather. "Worse than Chicago."

Bill's nickname came from his three years of crew oddly enough; he was always the quietest man in the shell. After his campaigning for Senior Class, the sweep-swinger's misnomer stuck. So "Wild Bill" he remains.

Active in his fraternity, his profession, and his university, Bill has managed to make his mark on the hill. His activities on the Senior Council have included the Senior Hat Committee, the Senior Class Cocktail Committee, and other social activities of the Class of 1950.

In the professional light, he shines as president of Kappa Tau Chi, honorary fraternity in Administrative Engineering, and as social chairman of both Pi Tau Sigma and Tau Beta Pi. He is active in the Engineer's Lounge Committee and the Kappa Tau Chi Course Survey Committee. Although these activities keep him busy, you can always find him at ASME meetings, whenever there is one on metallurgy.

Metallurgy is the field of Bill's fifth year project. His group is working on the job of getting data on a new material, nodular cast iron. They have to devise some new testing procedures besides utilizing old ones. Bill says that now he can appreciate just what goes into a stress-strain diagram. In recognition of his efforts in the metallurgi-

(*Concluded on page 34*)

Techni-Briefs

Sanitizing Burlap Bags

Disease germs are now literally being cooked to death in a new sanitizing operation which saves farmers millions of dollars a year and helps stretch this country's available jute supply.

Burlap feed bags are made safe for re-use by heating them in special giant dielectric high frequency ovens. Since these bags are durable enough to be re-used an average of five times, costs are cut to about one-fifth, and there is less drain on the jute supply available for new bags.

Jute, the raw material from which burlap is made, is not native to the United States, this nation importing nearly all of its supply from India.

After experimenting with steam, ultra violet light, and cyanide gas, it was found that heating with high frequency electricity was the most practical way to sanitize the feed bags for re-use. Bags in bales of 250 each were conveyed between electrodes in dielectric ovens and the temperature throughout the bales brought up to 230 degrees Fahrenheit, sufficient to kill undesirable disease organisms but not to burn or otherwise harm the bags.

Two of the largest dielectric ovens of their type ever built were constructed by General Electric specifically for this purpose, and are currently in use at the Eastern States Farmers Exchange in Buffalo, New York. Each oven is 44 feet long, 9 feet high, 9 feet wide, and operates at a frequency of about 13,000,000 cycles with a total power requirement of 120,000 watts per oven.

Used bags should definitely be freed of any disease germs before again being filled with feed. Even though between trips the bags are thoroughly air-suction cleaned, there is a possibility of a spread of animal and poultry diseases due to the re-use of bags after they have been in a poultry house or on a dairy farm.

The sanitizing cost with this new method is one-half cent per bag. It covers investment, labor, and electric current.

Television Microscope

Significant extension of the range, power, and versatility of the light microscope by use of special electronic eyes of the television camera, instead of the human eye, was demonstrated by scientists of Princeton University and the RCA Laboratories Division.

The new technique of televised microscopy, since it enables the interchanging of television camera tubes which are made sensitive to specific wave lengths of light, gives considerably sharper contrast than heretofore available, according to Dr. A. K. Parpart, chairman of the Princeton Department of Biology, who has tested the experimental RCA industrial television equipment in biological research since last April.

The television-microscope combination also has the advantages of making possible the study of many components of living cells normally visible only after killing and staining and the direct observation of motion of, and within, these cells at high magnifications. Even without the specially sensitized tubes a high degree of contrast enhancement can be obtained by means of the variable light level controls on the television receiver screen.

Though the RCA televised microscopy equipment has been used primarily for research at Princeton, it has proved convenient for showing specimens to several persons simultaneously in a conference group. It has also been used successfully in large classroom demonstrations by Dr. Harry Fulbright, former Princeton physics professor, in two otherwise difficult microscopic demonstrations—the Millikan oil drop experiment and the demonstration of Brownian motion in smoke particles.

The experimental installation consists of a laboratory microscope mounted beneath an industrial television camera, which is no larger than a personal 16-mm. motion picture camera. The televised microscopic scene is transmitted by cable to a standard receiver-monitor placed nearby.

At the heart of the industrial television camera is a remarkably small and sensitive pickup tube—the Vidicon, which can be sensitized with materials which make it receptive to a particular narrow band of wave lengths. For the model used at Princeton, a red-sensitive tube and a violet-sensitive tube have been provided. Research engineers are developing tubes which may extend the range of the microscope's vision into the infra-red and ultra-violet regions. The microscope can also be equipped with a binocular viewer and a second television camera so that two selective tubes scan the microscopic scene at the same time.

With the red or violet tube, it is possible to select a narrow wave length band for study of a particular cellular material whose light absorption characteristics lie in that band. The degree of contrast between various chemical components within the cell is much superior to that previously gained by the tedious method of photographing the specimen through color filters. In fact, some granules in living cells have been brought out this way for the first time.

Many biological specimens, such

as granules of certain red blood cells, can at present be studied only after they have been stained. With televised microscopy, the appropriate tube will make the specimen stand out clearly without staining. Staining often either kills a specimen or, in some instances, a specimen must be killed before it will absorb the stain.

New Turbojet Engine

The most powerful turbojet engine in the world has successfully completed ground tests that qualify it for quantity production, according to Navy and Westinghouse Electric Corporation spokesmen. The new jet, known as the J40, uses less fuel per pound of thrust than its predecessor, the J34, an engine that powers some of the nation's fastest planes.

Designed by Westinghouse engineers under the guidance of the Navy Bureau of Aeronautics, the J40 packs more potential speed into less space than any previous rotating engine ever built.

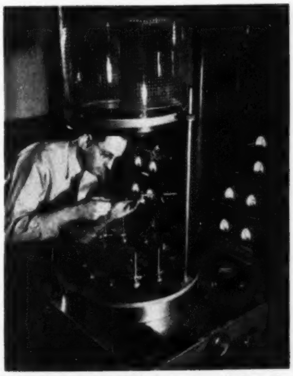
The thrust developed by the J40—equivalent to 14,000 horsepower at modern flight speeds—is for a "bare" engine, without thrust augmentation. The addition of an afterburner to reheat the exhaust gases, after they leave the turbine and before they emerge as a jet stream from the rear, together with other developments now in progress, is expected to almost double this figure.

The J40 is one of the most efficient basic operational turbojets, as well as the most powerful, yet to be made available to the armed forces. A group of high-performance military aircraft, now in the prototype production stage, has been designed especially to take advantage of the performance capabilities of the new engine.

However, total thrust and fuel economy in an engine are no longer sufficient qualities to meet modern flight needs. A plane's engines are being called on to perform a variety of functions that once were left to the pilot or to the plane manufacturer to worry about. Despite the enormous strides in airplane operating speeds and the extraordinary physical demands imposed by very high altitude operation, the new engine asks less of the pilot than any previous engine, either jet or propeller.

Operation of the J40 in any high-performance military plane will actually be simpler for the pilot than driving his car. The engine's electronic control system is completely integrated and automatic from standstill to top altitude and speed. From starting to full power, and under any condition of flight or altitude, operation of the engine is accomplished with a single cockpit control, equivalent to a throttle. All engine conditions are, in turn, automatically tied to this control.

Even impossible icing conditions do not matter to the J40 for it "simply burns its own way through ice" leaving the pilot free to attend to navigation, battle tactics, and battle itself.



The glass plate being prepared for the vaporization process.

—Courtesy of RCA

The J40 which was subjected to the grueling 150-hour qualification test—a test that all new engines must pass to be eligible for quantity production—had already been operated more than half the required test time before the official test started. In that time, it had run at military power almost twice as long as the test requires. Its use of lubricating oil during the test was 93 per cent less than was specified.

The J40 is of axial-flow design. But, unlike its predecessors which take in air through a circular orifice, the air intake of the J40 is divided into two elliptical openings, arranged like the letter Y. To maintain a minimum diameter for the engine as a whole, major engine and aircraft accessories are mounted between the arms of the Y, while minor accessories are strung out along the sides of the barrel of the engine to conserve space.

The J40 uses a unique annular combustion chamber. This annular design results in smaller combustor diameter than is possible with a number of separate can-type combustors arranged in a circle around the shaft. It also involves only a single flame, which is easier to control under difficult conditions than the multiple fires used in can-type combustors.

Color Television

Mirrors that reflect one color of light—red, blue or green—are being used by scientists to explore new methods of transmitting and receiving color television pictures. By depositing ultra-thin layers of metallic compounds on clear glass these scientists are able to produce mirrors that "see" and reflect only one color.

The mirrors are used at both the transmitting and receiving ends of the television system. At the transmitting end the mirrors pick up the color picture from the camera and break it down into its three basic colors—red, blue, and green—which are sent in the proper sequence through the system. At the receiving end another set of mirrors "gathers" in the colors, and regroups them in the color picture seen on the television screen.

To make their one-color mirrors, the scientists take a clear sheet of glass and place it in a big, glass-jar "oven" from which most of the air has been evacuated. Then they electrically heat a special metal compound until it melts and sends vapors rising through the glass jar. As these strike the glass sheet, they form ultra-thin layers of a smooth, even film.

The thickness of the film determines which color will be reflected by the mirror. For blue the thickness may be one-fourth the wavelength of blue light, or about 16 millionths-of-an-inch. To reflect green light, the layer is made slightly thicker, while red reflection requires the thickest films. The more layers of a particular thickness, the deeper the color.

The films act like "traffic cops"

(Continued on page 36)

Cornell Society of Engineers

107 EAST 48TH STREET 1950-51 NEW YORK 17, N. Y.

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George T. Minasian

"The objects of this Society are to promote the welfare of the College of Engineering at Cornell University, its graduates and former students and to establish closer relationship between the college and the alumni."

President's Message

Being President of the Cornell Society of Engineers has been most enjoyable. Telling you of some of the activities of the week ending February 17th may give some idea of the reason.

On February 13th at the New York Cornell Club, Deans Christensen and Rhodes were with us and the meeting was well attended. Chris and Dusty both did a fine job for the CE's and the ChemE's, respectively. The question period was particularly interesting and even the commuters seemed to forget their trains.

Even more pleasing and exciting for me was my visit to Ithaca on February 16th and 17th. The staff of the Cornell Engineer had invited me to their Annual Banquet at the Dutch. In the afternoon I saw them at work in Lincoln Hall—getting out the March issue and a little over an hour later they were the gracious hosts to the Directors and staff of the Engineering Colleges.

Editor in Chief, Tom Kelly, as Toastmaster must have established some sort of a record when he called on fourteen assorted deans, faculty advisors and professors and they completed their messages in the total elapsed time of something less than two minutes. Ted Wright, Acting President, gave us a fine picture of Research activities at Cornell.

The results of the election to the staff of the Cornell Engineer for the new year was announced.

On Saturday Dean Hollister brought me up-to-date on the effect of the National Defense Program on the colleges. I gathered that definite progress is being made towards a saner program; that engineers, under-graduates and graduates alike should not be stampeded, should stay put until plans are worked out to use them and their training to the best advantage.

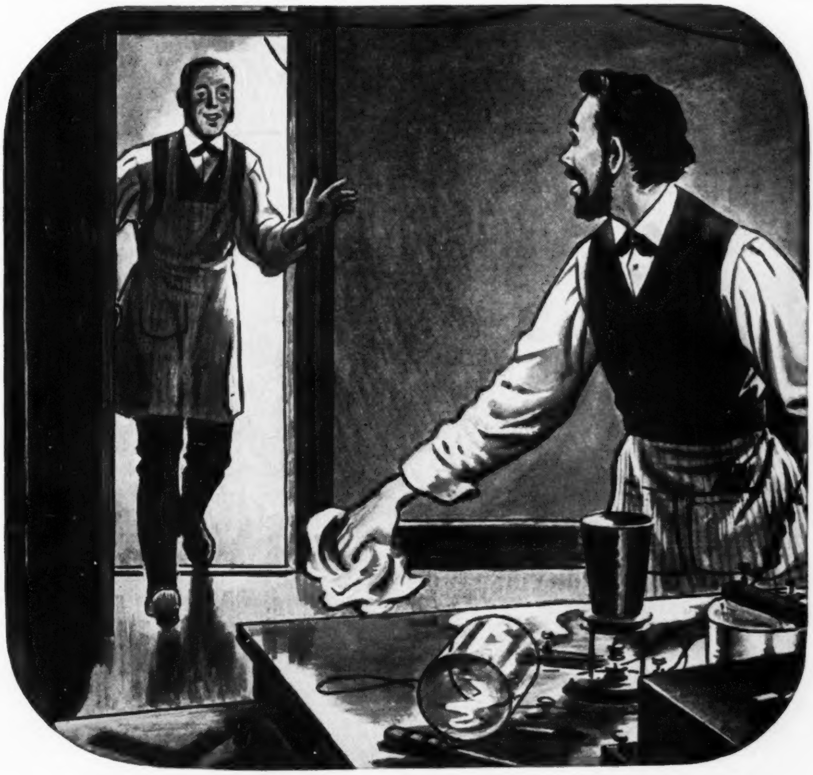
I also visited my classmate, Bill Emerson, the new Vice President in charge of University Development. In spite of many problems, I found him optomistic that Cornell was in a good position to meet its obligations and contribute its full share in the National Emergency.

Perhaps the most active spots these days are the placement offices, both in Ithaca and New York.

John Munschauer is arranging an average of 140 interviews a day between students and prospective employees. At the same time Paul Reyneau in New York has a record number of requests for men to fill jobs of real importance. To appreciate the scope of this activitiy you have to see it for yourself.

Remember March 27th—That is the day the panel of fifth year students from the Engineering Schools will put on their own program at our New York meeting at the Cornell Club.

GEORGE T. MINASIAN



"Mr. Bell, I heard every word you said—distinctly!"

75 YEARS OF TELEPHONE SERVICE

On the evening of March 10, 1876, on the top floor of a boarding house in Boston, the telephone carried its first intelligible sentence.

It seemed like a miracle to our grandparents and great-grandparents. Yet today, the telephone is a part of our everyday living. And that is the real miracle—the fact that the telephone has come to mean so much to so many people in so many ways.

The telephone is an indispensable tool of business and government—today's tremendous job of production and defense could not be carried on without it. It serves in minor emergencies and great ones. It helps maintain family and community ties. And it keeps right on growing and improving.

Never in the history of the telephone has it been so valuable to so many people as right now.

BELL TELEPHONE SYSTEM

Alumni News

John C. L. Fish, C.E. '92, is co-author with Theodore J. Hoover of a second edition of **The Engineering Profession,** published by Stanford University Press. Mr. Fish is emeritus professor of civil engineering at Stanford and lives at 1336 Emerson Street, Palo Alto, Calif.

John D. Mickle, M.E. '93, is vice-president and director of the Chatham State Bank. From 1934-46, he was sanitary engineer in Columbia County. He was president of Chatham Electric Co., 1914-24; treasurer of Deposit Electric Co., 1912-14; sales-manager in the Syracuse office of Westinghouse Electric, 1900-12; and school commissioner in Columbia County, 1894-1900.

John W. Sheffer, M.E. '07, has retired as general improvement engineer for American Car & Foundry Co., after forty-two years of engineering in plant operations. His address is 1557 Overbrook Road, Williamsport, Pa. His son, **John W. Sheffer, Jr., '39,** is purchasing agent for Paulsboro Manufacturing Co., Fullerton, Pa., and lives at 123 Elm Street, Emaus, Pa.

John S. Gorrell, M.E. '05, retired executive of the Chesapeake and Potomac Telephone Co., is making a study of telephone needs for the U.S. Marine Corps at Quantico, Va. He lives at 405 Magnolia Avenue, Frederick, Md.

George A. Belden, '11, C.E. '12, has been reappointed for a five-year term to the Georgia board of registration for professional engineers and land surveyors. He is assistant chief engineer for Central of Georgia Railway, Savannah, Ga.

George M. Heinitzer, C.E. '15, is district bridge engineer, Pennsylvania Department of Highways. His home address is 5227 Fifth Avenue, Pittsburgh, Pa.

Allen Mulford, M.E. '15, is commercial vice-president, International General Electric Co., 1 River Road, Schenectady.

William Spivak, C.E. '20, is a civil engineer connected with the office of the President of the Borough of Brooklyn. He is vice-president of the Municipal Engineers of the City of New York, president of the Association of Civil Engineers in the New York County chapter of the New York State Society of Professional Engineers. He lives at 8714 Twenty-first Avenue, Brooklyn 14, N. Y.

Pietro Belluschi, C.E. '24, Portland, Ore., architect, becomes dean of the MIT school of architecture this month. Among the 600 buildings he has designed are the Equitable Building in Portland, winner of the 1950 award of the Pan American Congress of Architects, and the Portland Art Museum, and Finley's Mortuary, which won awards from the American Institute of Architects. **Life** magazine featured a "minimum house" he planned and Progressive Architecture gave him a "first" for the "most progressive house built in 1948." President Truman appointed him in June to the National Commission of Fine Arts.

John P. Syme, M.E. '26, a senior Vice-President and Assistant to the Chairman of the board of the Johns-Manville Corporation, was inducted into the Quarter Century Club, a society composed of persons with more than 25 years service with the company. He is a Director of the United Medical Service; member of the Board of Governors of the Cornell Club of New York, University Club of New York City, Sons of the Revolution, Essex Yacht Club, Delta Upsilon and a past President of the Cornell Society of Engineers.

T. C. Borland, M.E. '35, has been named assistant division production superintendent of Stanolind Oil and Gas Company's Central Division. Previously, he had been division engineer in the company's Texas-Louisiana Gulf Coast Division at Houston, Texas. Mr. Borland is a member of the American Institute of Mining and Metallurgical Engineers.

Karl J. Nelson, B.Ch. E. '39, has transferred from Standard Oil Development Co. He joined the Development Company in 1939. His home is at 321 North Avenue East, Cranford, N. J.

Robert G. Coe, M.E. '42, is with Carrier Corp., Syracuse, manufacturers of air conditioning and refrigeration machinery. He has been with York Corp., York, Pa.

Robert F. Brodsky, B.M.E. '46, is a research engineer in aerodynamics with Sandia Corp., Albuquerque, N. M. He received his DSc in engineering at NYU where he was an instructor in mechanical engineering.

John P. Bagby, M.E. '46, has been promoted to production manager of Bagby & Co., manufacturers of food packaging machinery. The Bagbys, who live at 729 Hinman Avenue, Evanston, Ill., have a daughter, Carol Jean.

Origin of the Universe

(*Continued from page 7*)

lieved to be, by weight, one part gas and dust to one part stars. The basic elements of matter are spread homogeneously through any large segment of space. The vacuum of space far exceeds any ever created in a laboratory, yet a funnel extending from the earth to the sun would contain 150,000 tons of hydrogen alone. Thus "empty" space is only relative.

Information Needed

Cosmogonists warn of projecting a view of the whole universe from the small segment so far seen through the telescope. To specify the curvature of the universe and therefore the type of universe the scientist needs three pieces of information. They are: the mean density of matter for the calculation of the size of the universe, the proportionality constant in the velocity-distance relationship established by the red shift, and measurements at greater distances in space showing neither a deviation from linearity in these velocity-distance relationships, or providing a value for the curvature of space. It is hoped that information gleaned from data taken at Mt. Palomar will provide the answers to these missing details.

Kant's Theory

Prompted by man's interest in the latter question of the origin of the planets, theories explaining the birth of our planetary system have appeared fairly regularly ever since Immanuel Kant in 1775 presented his theory to the world. He speculated that the sun and planets formed by condensation from a gaseous cloud. This "nebula hypothesis" later lost scientific favor. More modern astronomers, notably Sir James Jeans, acknowledge this possibility for the sun but not for the planets. Jeans suggests that another star grazed the sun, pulling out a thread of sun matter that gathered into beadlike planets. Nonscientific people favored this "catastrophic explanation" of the origin since they liked to believe that man and his earth are unique in the universe. The extreme rarity of such a collision between stars, (the chances are 1 in 5×10^{18} years), substantiated the belief that the earth is the only chunk of matter with proper conditions for life to develop.

Kant's theory was recently brought up again by astronomers for reconsideration and amplification. Astronomer Gerard P. Kuiper, of the University of Chicago was one of the principles involved in this neo-Kantian hypothesis. He concludes that the dust cloud around the nascent sun passed through a stage with approximately one third of the system's matter forming a thin pancake shaped disk somewhat like Saturn's rings. This disk, according to Kuiper, grew denser and denser until it became unstable and broke into whirling eddies of the dust materiel. These eddies, named "proto-planets" by Kuiper, condensed into planets, each with a smaller disk of materiel around it from which satellites formed. Saturn's ring did not condense because it was too near the planet and the strong gravitational force kept the ring matter within its orbit. The part of Saturn's disk which was retained formed the rings we see today.

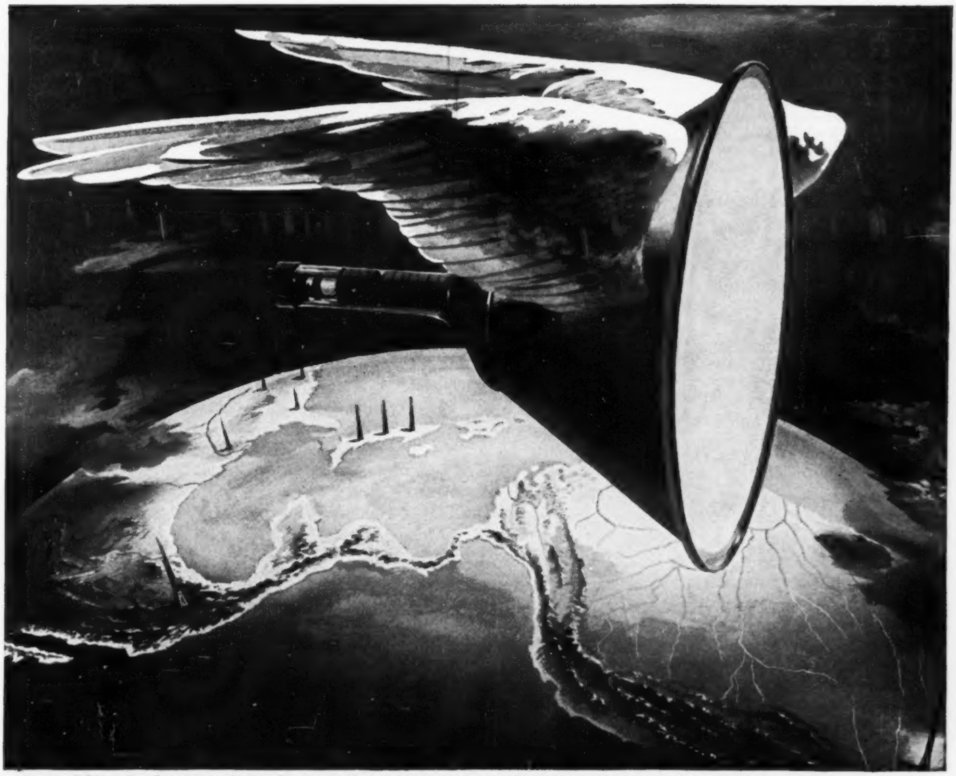
The composition of the planets was determined largely by the temperatures of the cloud regions from which they were formed. Mercury, Venus, Earth—close to the Sun, were of dense materiel which became solid at fairly high temperatures. The planets far from the Sun —Jupiter, Saturn, Neptune, are gases, water, ice or hydrocarbons.

Origin of Moon

Kuiper thinks that the Moon was not formed this way but is part of a double planet system formed when the other planets were created. The craters on the Moon's surface were caused by materiel raining down from the disk common to both Earth and Moon. Similar marks on the Earth were erased by the erosive action of the atmosphere which the earth was large enough to support.

Kuiper's theory makes it much less likely that man is alone in the

(*Continued on page 26*)



Five new RCA-equipped stations in Mexico, Brazil, and Cuba, add television to the forces which make Good Neighbors of all the Americas.

Now television goes "Good Neighbor"

As little as 10 short years ago, television—to the average man on the street—seemed far away. Today, television is in 10,500,000 homes.

Newest demonstration of TV's growth is its leap to Latin America. 3 RCA-equipped stations are now in Cuba, 1 in Mexico, another in Brazil—and more are planned. They are contributing to television progress by following a single telecasting standard. They also use developments from RCA Laboratories: the image orthicon television camera, electron tubes, monitoring equipment, and antennas.

And as our neighbors to the south watch television at home, they see another development of RCA research—the kinescope. The face of this tube is the "screen" in all-electronic home TV receivers . . . on which one sees sharp, clear pictures in motion.

* * *

See the latest wonders of radio, television, and electronics at RCA Exhibition Hall, 36 West 49th St., N. Y. Admission is free. Radio Corporation of America, RCA Building, Radio City, New York 20, New York.

Continue your education with pay—at RCA

Graduate Electrical Engineers: RCA Victor—one of the world's foremost manufacturers of radio and electronic products—offers you opportunity to gain valuable, well-rounded training and experience at a good salary with opportunities for advancement. Here are only five of the many projects which offer unusual promise:

- Development and design of radio receivers (including broadcast, short wave and FM circuits, television, and phonograph combinations).
- Advanced development and design of AM and FM broadcast transmitters, R-F induction heating, mobile communications equipment, relay systems.
- Design of component parts such as coils, loudspeakers, capacitors.
- Development and design of new recording and producing methods.
- Design of receiving, power, cathode ray, gas and photo tubes.

Write today to National Recruiting Division, RCA Victor, Camden, New Jersey. **Also many opportunities for Mechanical and Chemical Engineers and Physicists.**

RCA

RADIO CORPORATION of AMERICA

World Leader in Radio — First in Television

Origin of the Universe

(*Continued from page 24*)

universe. Since the sun is an ordinary star, it is quite conceivable that some among the countless other stars may have acquired life even more developed, today, than ours.

Solar Evolution

Another theory dating back many years is the one which has the planets originating directly from the sun. This "solar evolution" has the planets breaking off from the sun as a result of some tremendous force such as the gravitational attraction of a large planetary body whose orbit came close at one time to the Sun. There are two objections to this theory which account for its lack of support. First, the outer planets are too far away from the Sun to have been torn from it and flung out into space. Secondly, the composition of the sun is mostly hydrogen and helium. All other elements are quite rare. Yet, the planets are composed principally of the heavier elements which could not have come from a sun whose composition does not include them.

A novel and very interesting theory was formulated within the last decade by Georges Lemaitre, a Belgian priest. He visualized the whole universe starting as a single super-atom of unimaginable energy content that exploded about 2 billion years ago. If his hypothesis holds, all energies we are aware of today, from the bursting brilliance of giant stars to the feeblest kicks of dying protoozoans are but varied expressions of that vast primal explosion.

Lemaitre's mathematical calculations carried him back to the beginning-point where neither time nor space existed and all matter which eventually came to constitute the stars and planets was present only potentially as terrifically high energy in one single cosmic bomb.

New Theory

Within the last year, two Cambridge mathematicians presented their new theory which shows promise of settling, at least for the time being, the two questions that have been discussed. The unusual part of their work is that it encompasses the whole universe, explains both major questions, and does not collapse in spots as previous theories had done. Perhaps this is so because Lyttleton and Hoyle, the two collaborators, attacked the problem from a new angle. They had both spotted a key bit of information: that the major part of the universe is not in the stars but in the thin stuff between them. I have already mentioned this, but it is significant that none of the other theories discussed made use of it as a basic premise!

Originally Hydrogen

They started with an empty universe filled uniformly with hydrogen. The gravitational instability of such a thin gas then begins to play a major role as the atoms attract and repel each other and eventually form great clouds of gas. These gas clouds move through space gathering in smaller clouds, eventually crowding together into tremendous gaseous masses outweighing millions of heavenly bodies. These masses of hydrogen are also spinning as they travel through space and thus spread out into the disk-like shape we have encountered before. Within the disk, clots of matter form which pack towards the center, getting hot as they do so. When the cloud has contracted sufficiently its center is hot enough to start the nuclear reaction which turn hydrogen into helium and thus provides the continuous production of energy with which a star burns.

Star Is Formed

Once this nuclear reaction has begun, a star, as it is now called, could pursue its way in space almost indefinitely while its supply of hydrogen lasted, were it not for the same interstellar materiel from which it was formed existing. A star which gathers too much of this materiel begins to use up its hydrogen too rapidly and consequently burns itself out too soon.

Those normal stars which burn their hydrogen at a normal rate eventually turn all of it into helium, and thus end their natural life. The star begins to contract as matter from the periphery falls to the

(*Continued on page 28*)

Origin of the Universe

(*Continued from page 26*)

center. The center gets hotter and hotter and the mass begins to spin faster. This spinning and contracting may be terminated prematurely as portions of the periphery fly off into space exposing the hot interior and causing what we call a "nova."

If the "nova" does not occur and the shrinking process is continued the star approaches the earth in size with a density at the center of a billion tons per cubic inch. The surface is now emitting torrents of X-rays and the speed of revolution is near 100 million miles per hour. The center, which has been growing hotter all along, approaches a temperature 300 times that of the interior of the Sun. This sets off new nuclear reactions releasing countless free neutrons. Other energy-absorbing reactions take place and as a result the interior of the star is suddenly cooled. The star collapses releasing so much gravitational energy in a matter of minutes that most of it is blown away in a stupendous explosion. The outer layers fly off as incandescent gas; the inner regions of heavier elements formed during the nuclear reactions at the recent high temperatures also leave, but at lesser speeds. The exploding star shines with magnificent brilliance in what we term a "supernova."

Supernova Formed Planets

Hoyle and Lyttleton believe that our planetary system owes its birth to such a "supernova." They say that a binary star to the Sun once became a "supernova" and the slower moving products of the explosion were captured by the attraction of the Sun and formed a gaseous disk again around it. This disk became, in time, the planets. The beauty of this scheme is that the mystery of the difference in composition of the planets and the sun is explained. The "supernova" occurred precisely because heavier elements were formed in the companion star. When it blew up, it is natural enough that the planets formed will be composed of heavier elements in contrast to the composition of the Sun. If we are to accept their theory, a finite life to our solar system can be predicted. In about ten billion years the Sun will get hotter thus killing any inhabitants on the planets. Forty billion years later it will swell up and consume those heavenly bodies near it.

To deal with the problem of the "red shift" and the moving galaxies, Hoyle and his colleagues approached the problem from a different point of view than the velocity-distance relationships before mentioned. They started with the assumption that the universe is in a steady state. Einstein's four dimensional space depends for its curvature or size on the quantity of matter within it. Hoyle reasoned that, if matter were constantly being added to the universe it would have to stretch, carrying the galaxies with it. Two independent calculations from different starting points yielded the same result. Approximately one atom of hydrogen

(*Continued on page 34*)

Aluminum melts at 1217°F....

What's the melting point of fused aluminum oxide?

- ☐ *1652°F.*
- ☐ *2732°F.*
- ☐ *3272°F.*
- ☐ *3722°F.*

Not 1652°F. which is a bright red heat; nor 2732°F. which is white heat; nor 3272°F., the highest temperature in a blast furnace.

Yes, the melting point of fused aluminum oxide (as made by Norton from the mineral bauxite under the registered trade-mark Alundum) is 3722°F. That's why it's such a popular refractory material. Because it also possesses high thermal conductivity and low electrical conductivity when hot, it is used extensively in both fuel and electrically heated furnaces.

In the Norton Mechanical Laboratory W. M. Wheildon, Jr., B. S. and M. S., Massachusetts Institute of Technology '30 and '31, takes readings on a wear-testing machine which he developed.

Harder Than Cemented Tungsten Carbide

Alundum grains in various crystalline structures are widely used as abrasives. On the Knoop scale, they have a hardness of 2000, the same as the sapphire.

As the world's largest manufacturer of abrasives, Norton has worked wonders with Alundum grains. Highly skilled, college-trained research men in Norton's laboratories have succeeded in giving to Alundum abrasives a wide range of physical properties by controlling the size of crystals and their chemical and physical properties.

In the Norton Ceramic Laboratory O. J. Whittemore, Jr., B. S., Iowa State '40, operates a load test furnace of his design — a furnace that tests refractories at temperatures up to 2450°C.

32 Alundum Abrasive

The crowning achievement in aluminum oxide chemistry was the creation by Norton of a unique single-crystal grain structure of unusual sharpness. Named "32 Alundum," it has been hailed as the "greatest abrasive contribution to increased grinding production in more than 40 years."

Remember Norton

There is a bright future in the abrasive industry for young engineers whose talents run in that direction. Remember that Norton is dedicated to "making better products to make other products better."

NORTON

TRADE MARK REG. U. S. PAT. OFF.

Making better products to make other products better

ABRASIVES · GRINDING WHEELS · OILSTONES · ABRASIVE PAPER & CLOTH · GRINDING & LAPPING MACHINES · LABELING MACHINES · NON-SLIP FLOORING · REFRACTORIES · CERAMIC SURFACE PLATES · BORON CARBIDE PRODUCTS

NORTON COMPANY, WORCESTER 6, MASSACHUSETTS

BEHR-MANNING, TROY, N. Y. IS A DIVISION OF NORTON COMPANY

Cartography

(*Continued from page* 12)

cult to trace drainage patterns or to identify certain features from the photographs.

Photogrammetry is the portion of Cartography devoted to the interpretation and measurement of photographs. The most startling advances have been made recently in the analysis of controlled aerial photographs, especially in the field of stereogrammetry. The tools and methods used in making maps in this manner take full advantage of all of our modern developments in machine design and scientific discovery. Probably the most recent research has been done in positioning the camera in space by electronic means at the instant the photograph is taken. Special applications of Radar, Loran, or Shoran are examples of this electronic control. The science of optics plays a major role in all photogrammatric work—in cameras, stereoscopes, rectifying projectors, contour plotters, and stereoplanigraphs.

The least involved — but most widely used—of these instruments is the lens stereoscope, which magnifies as well as fuses two matched photographic images into one relief model. This same principle has been expanded to more intricate, delicate devices which are used to rectify, plot, and contour large areas. The map manuscripts from these instruments can be produced faster and more accurately than by any previous method, especially if the terrain is at all inaccessible.

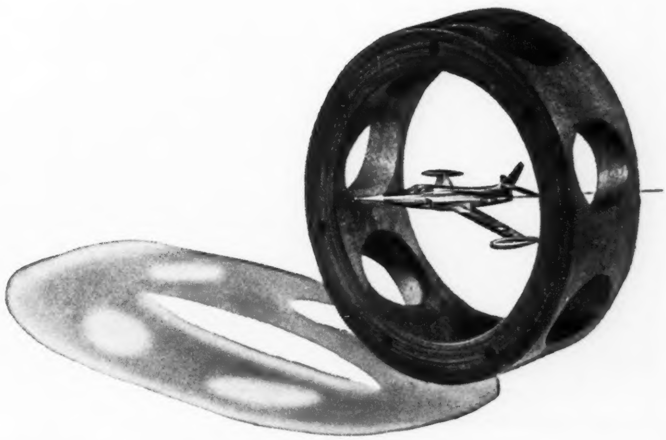
Photogrammetry, then, produces map manuscripts to scale from an overlapping series of controlled photographs. These manuscripts show the planimetry of the area, with every necessary physical feature delineated by symbol or line, and often with relative elevations indicated by contours. Such master copies are not always complete as to details or accessory information, but transparent overlays of some of the newer plastics are used to record supplementary data. Thus, before the map goes into the reproduction stage, the manuscript may consist of a number of highly correlated sheets and reports ready for the final drafting. Much of this material is photographed to a convenient size and returned to a field-check party for completion and checking. No aerial photograph can be used alone to determine the names of the features, political boundaries, or the classification of structures or roads.

When all of the pertinent items have been compiled to the final manuscript form, the map is rephotographed and photoprinted to the drafting scale for inking and lettering.

If the map is to be published in one color only, the manuscript is duplicated and drawn in its final likeness with all lettering and symbolization in place. If convenient, this drafting may be done at a larger scale than that of the published map and later reduced photographically for the printers.

If the map is to appear in a number of colors, the amount of draft-

(*Continued on page* 32)



Cartography

(*Continued from page* 30)

ing is much greater and becomes increasingly difficult. For instance, a master copy for each color of the finished map must be prepared, and absolute registration of all copies must be maintained. This perfect register is obtained by printing the photographic copy of the map manuscript in light non-photographic blue on a series of metal-mounted drafting sheets. These images are identical, and one sheet is arbitrarily assigned to each color for inking. Thus, everything to appear in brown on the published map is drawn in black india ink by the draftsman who is working on the "relief or brown board." Similarly, other draftsmen may be inking the "blue or drainage board" containing all the hydrography, or the "green or timber board" showing all appreciable areas of woods or brushwood.

After each color board has been inked properly in black, edited, and checked, it is again photographed, this time to the exact publication scale. These negatives are usually made on heavy plate glass so that there will be no expansion or contraction of the emulsion, and they show only the black ink image of each color board, since the original blue-line copy is non-photographic.

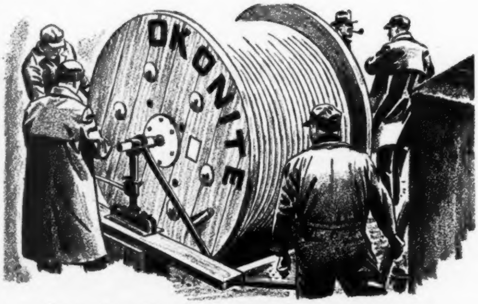
Press Plates

Lithographing

These glass negatives are used to make aluminum or zinc press plates for the photo-lithographic offset presses. The map sheets are run through the presses for each color of ink and its correseponding press plate, and extreme care is taken to print the colors exactly in register. For topographic maps of the United States, the usual press runs are for the black or culture plate, brown or contour plate, blue or drainage plate, light blue or blue tint water-fill plate, green or timber plate, and the red road or road classification plate. Sometimes special plates are prepared for an army grid or for shaded relief, but the usual procedure is followed in drawing them on metal-mounted drafting boards or on stable plastic vinylite or dyrite overlays.

The expanding national program in Cartography and its related fields of Photogrammetry and Airphoto interpretation has made the teaching of courses in these subjects necessary in up-to-date universities. In Ithaca, the "Cornell Center for Integrated Aerial Photographic Studies" has been organized to offer a comprehensive plan for instruction and research which would correlate the efforts of many diversified departments of the University. The courses are aimed primarily at a recognized need for developing the natural resources of the world as a means of seeking world peace. The courses in Cartography and Map Reproduction include map design, construction, and color separation, with emphasis placed on the uses of maps in the fields of geology, geography, forestry, and soil science.

(See ENGINEER, Jan. 1951, for more information on the Cornell Center for Integrated Aerial Photographic Studies.)



Prominent Engineers

William Jennings, ME

(Continued from page 17)

cal field, he received a Foundry Educational Foundation Scholarship for the current year.

In the near future Bill hopes to go to Harvard Business School, after which maybe into the foundry industry or the automotive fields.

Queried about any fair young thing in his immediate future, Bill replied cryptically, "I bought a used car and found that what my father said was true—that you can let your girl starve for a while, but you have to feed your car to make it work."

Origin of the Universe

(Continued from page 28)

added to each quart of space every billion years would make the galaxies recede at the observed rate!

Where this hydrogen comes from, they do not know. But they have postulated a pretty scheme which enables the conservation of mass to hold on the universal scale. The receding galaxies which disappear, they say, are exactly equal in mass to the hydrogen which is formed. This new universe of Hoyle and Lyttleton is a continuous one which will never run down or become the dead, empty place predicted by the Monatonic and Asymptotic models. On the contrary, new hydrogen is constantly being supplied to make the new galaxies, stars and planetary systems to replace those which disappear on the edge of space.

The Lyttleton and Hoyle school of thought may not have the final answer. It is very difficult to prove anything when dealing with cosmogony. Still, their work is a significant achievement in man's tracking down the truth. This search for knowledge of the universe he lives in has produced profound changes in man's view of himself in the cosmos. They are well summed up in the words of Andre Malreux—"The greatest mystery is not that we should have been thrown up by chance between the profusion of the stars, but that, in that prison, we should be able to get out of ourselves images sufficiently powerful to deny our insignificance."

Techni-Briefs

(*Continued from page* 19)

in directing the return of the desired color from the mirror. Although all colors of the spectrum strike the surface, only that one bounces back which corresponds to the right film thickness. All others pass through the mirror, so that the eye sees by reflection the desired color, and by transmission the complementary color.

Garbage Disposal

Following a successful venture made in Jasper, Indiana, earlier this year, Herrin, Illinois, has licked its garbage disposal problem by going into the electric appliance business and selling G.E. garbage disposers to its citizens.

Herrin coud not afford a regular garbage collection and the town's full trash cans had become a breeding place for insects and a target for stray dogs. The city water department, after receiving the approval of the citizens bought the disposers and sold them at a special price.

Supersonic Stovepipes

(*Continued from page* 10)

first type to be perfected. From these missiles much can be learned for the development of longer-range weapons.

But granted that Russia's Peenemunde may still have somewhat of an edge over the U. S. missile industry, long-range atomic-warhead missiles still are at least five years away. For neither Russia nor the United States can afford to trust the multi-million-dollar atomic bomb to an unproven carrier which may waste it. Therefore missiles must first prove themselves in actual warfare and over a period of practical usage before larger missiles will be entrusted to carrying the atomic bomb.

Even with the relatively small investment in the subject, guided missile development in this country has been progressing rapidly, and the progress has been continually accelerating. With this year's new and much larger appropriation, more great strides in the missile development race are assured.

Build Confidence ON BROAD EXPERIENCE

by ARCH COOPER
Manager, Empire Region
ALLIS-CHALMERS MANUFACTURING COMPANY
(Graduate Training Course—1909)

YOU NEED the confidence that comes from wide experience, whether you intend to be a salesman, designer, researcher, or production man. Confidence based on knowledge is one of the greatest assets an engineer can have. Here is what I mean.

ARCH COOPER

You may visit a mine with the idea of talking about crushing equipment, but find that their engineers have an electrical problem. Or you may visit a utility to talk about electrical equipment and find that they're all excited about a pump break-down.

Offer All-Around Help

Can you help them? Or are you just another peddler who is taking their time when they have problems on their minds. In my work I call on electric utilities, cement plants, machinery builders, textile mills, paper mills, shoe factories and many other types of plants. In each of them, I try to help the engineers and mechanics I call on.

It's a good credo for salesmen, but it takes broad experience to carry it out. It's the kind of experience you must deliberately set about acquiring as early as possible. I had heard of Allis-Chalmers equipment, seen A-C's giant Corliss engines in Australia's biggest power plant and decided to study design at Allis-Chalmers. It looked like the best place in the world to get a broad engineering background.

High temperatures and speeds raise tough design and production problems on giant steam turbine spindles like these.

I joined the Allis-Chalmers Graduate Training Course after graduation from Sydney Technical College in 1908 . . . worked on steam turbines, wound coils of all types, performed tests for the electrical department. After that there were field trips to erect electrical equipment. It was soon apparent that I wasn't a designer at heart, and my sales career started.

Broad Opportunity

Forty-one years later, Allis-Chalmers still offers the same opportunity for broad experience. A-C still builds equipment for electric power, mining and ore reduction, cement making, public works, pulp and wood processing, and flour milling.

And the Allis-Chalmers Graduate Training Course is still flexible. Students help plan their own courses. They can switch to design, manufacturing, research, application, sales, or advertising—divide their time between shops and offices—and can earn advanced degrees in engineering at the same time.

Men at Allis-Chalmers get a close-up of the basic industries. No matter what path they take in the industrial world, experience gained with this broad organization lays a foundation for the confidence that comes with all-around knowledge.

Textile mills are getting adjustable speed at lower cost by using new automatic Vari-Pitch sheaves on spinning frames as shown.

ALLIS-CHALMERS A-C

Allis-Chalmers Manufacturing Company, Milwaukee 1, Wisconsin

EDITORIALS

Engineers' Day

Plans are now under way for Engineers' Day 1951, to be held Friday evening, April 27th under the sponsorship of the Engineering Council. A few words regarding the spirit and objects of Engineer's Day are in order, especially for the freshmen, and for those upperclassmen who have never taken much interest in E-Day proceedings.

Basically, Engineers' Day is an opportunity for the engineering students to show tangibly to their friends and relatives some of the aims, problems, and results of engineering training. Every day we rub elbows with arts students, hotel students and others, the nature of whose work is fairly well known to us. But to many of these people, what we do in the hallowed halls of Sibley and Franklin, of Olin and Lincoln, is a complete mystery. Their impression of the engineer's work is in some vague way connected with the slide rule and with incomprehensible technical terms; it is, to the non-engineer, all pretty baffling.

On E-Day all mystery is dispelled from the formidable buildings of the Engineering College, and by means of the demonstration of equipment and the explanation of projects an effort is made to inform all who are interested about what actually goes on in engineering. Many displays also show the application of engineering to fields not ordinarily considered by the layman.

A most important by-product of all this is that E-Day gets engineering students to work together as a team to put across to others the ideas and ideals of their profession. While promoting our profession to outsiders, we gain a better understanding of it ourselves, and become acquainted with engineering fields other than our own. Thus ME's can get some idea of the ChemE's problems, EE's can be enlightened on the work of EP's, etc. A beneficial broadening of one's own outlook is the inevitable result of such cross-education, no matter how brief.

And finally, the student-faculty cooperation which is necessary to make E-Day successful is a definite asset to the whole Engineering College. It is only by close student-faculty teamwork that E-Day can be put over properly, and a successful E-Day is both a cause and a result of such understanding, which is so valuable throughout the school year.

A successful E-Day works to the benefit of every engineering student. It "puts us across" to the rest of the campus; it broadens our individual outlooks, and it promotes and results from smooth student-faculty relations. With a little help from everyone when called upon, E-Day '51 should equal or surpass the success of former years.

T.J.K.

Alumni Authors Needed

This message is addressed to our alumni readers—the major part of our circulation. It is directed at you because we are in need of help, and you people are the ones in a position to give us this assistance. As you are all probably aware, the ENGINEER publishes articles written only by Cornell people—students, profs, and alumni. We feel that we have enough talent in our own group not to have to rely on outside sources for contributions.

As far as the student articles are concerned, we of the Editorial Board feel that it is a major part of our education to have the opportunity to write these articles, and the magazine thus has no trouble filling its quota of such material. Our profs are only too willing to help us out with articles in their fields, and we know whom to contact when we want articles on certain topics.

When we get to the matter of alumni articles, however, we come up against a rather sizable problem. Since we do not have much personal contact with alumni, it becomes rather difficult to determine exactly whom to contact for certain topics, and to know who will be willing to contribute.

Consequently, we are putting this piece in the magazine as a general plea to our alumni for feature articles. If you would like to write one at any time in the future, please send your name and preferred topic to us, and we will contact you as soon as we can use your material. For any further information along these lines, you may write to the Assistant Editor and you will be given the most complete cooperation possible short of the actual writing of the article.

A.B.

To those readers of the ENGINEER who begin the magazine at the back, we feel that we owe an explanation for the absence of the "Stress and Strain" column usually found here. We have omitted the section from this issue in an attempt to make our readers aware of a problem that now confronts the staff.

We have received many letters criticizing the inclusion of the joke page. The staff is undecided on the issue, and we would like to throw the question open to our readers. Should the ENGINEER continue publication of "Stress and Strain?"

Briefly, the main arguments are these: pro—the jokes provide relaxing entertainment in the midst of all our technical work; con—the tone of the magazine is lowered by the joke page.

....We would like to hear from as many of you as possible. Please address your comments to the CORNELL ENGINEER, Lincoln Hall, Ithaca, N. Y.

AB